

# PATENT SPECIFICATION

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## DRAWINGS ATTACHED

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## (54) EXTRACTION OF PALM OIL

(71) We, HUMPHREYS & GLASGOW LIMITED, a British Company, of 22 Carlisle Place, London, S.W.1., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the extraction of oil from palm oil fruits. More particularly, it concerns heat treatment of fruit bunches in the first part of the extraction process.

Enzymes which have a fat-splitting action are present on the fruits and it is essential that they should be destroyed in order to avoid losses of oil due to their action during processing of the fruits.

To inactivate the enzymes the fruits must be heated at a minimum temperature of 55°C. for a period; also heating to a temperature of at least 100°C. is necessary to coagulate albuminous materials present in the fruit, to bring about hydrolysis of mucilaginous matter and to loosen the fruits from the stems. In the present methods heating at about 120°C. for some 10 minutes is carried out to loosen the pericarp from the nuts. Since overheating and discolouration of the kernels is a function of maximum temperature and time of heating it is the controlling factor in this part of the process affecting as it does a substantial proportion of the total oil content of the fruits.

At present the generally used method involves heating the fruit bunches with wet steam in a sterilizing chamber into which a string of bogies is passed, each loaded with a cage containing fruit bunches. The sterilizer is then closed and the charge is steamed for about sixty minutes. The method is thus batchwise and empirical. It involves a considerable amount of handling and is wasteful of palm oil and of heat.

The fruit bunches are transported from the field in road or rail trucks and are loaded into the cages which are first lowered into a pit, and when filled are lifted and placed on the bogies. Each cage holds about 1½

tons and a batch for sterilizing usually comprises five bogies. During handling the fruits are bruised, and the damage is aggravated by pressure due to the weight of the charge. This results in appreciable loss of oil, which is able to leak away through the apertures of the cage before, during and after the sterilization procedure, and there is a further loss of oil by action of the fat-splitting enzymes on the bruised fruits during the waiting period before sterilization. During sterilization loss of oil from the damaged fruits is of course aggravated by action of the steam and by leakage from the cages.

Transmission of heat through the charges is poor because of air pockets and uneven inefficient heating and sterilization results.

From the sterilizer the fruits are moved to a stripper for separation of the fruits from the bunches, and by the time the contents of the last cage of a batch reach the stripper they have cooled down considerably. This is a disadvantage later in the steps of removal of the pericarp from the nuts and extraction of the oil from the former. Even feeding of the stripper from the large cages also presents difficulty.

We have now discovered a way of obviating some or all of the foregoing disadvantages.

Accordingly the present invention provides a process for the extraction of oil from oil palm fruits which process comprises the step of subjecting the fruits to di-electric heating, in order to inactivate the oil-splitting enzymes present in the fruits.

Preferably the di-electric heating is achieved by passage of the fruits continuously through a microwave heater.

Advantageously the said heating is effected before removal of the fruits from the stems of the bunches.

Conveniently the fruits or the bunches of fruit are passed on a mechanical conveyor through the microwave heater.

Removal of oil from parts of the fruits after the said heating may be effected by extraction with one or more solvents, or by mechanical means or by both methods. Suit-

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able mechanical devices are screw and ram presses and centrifuges; acetone is a suitable solvent.

The microwave heater as employed in the invention is conveniently a device in which a body or substance is heated by subjection to the action of an oscillating electro-magnetic field with a frequency from  $1 \times 10^6$  to  $30 \times 10^6$  cycles per second.

The following is a description of a process according to the invention which is illustrated by the accompanying diagram in which 1 represents a road or rail truck, 2 a collector or silo and 3 a mechanically operated band or belt conveyor.

The bunches of fruit are loaded from the truck 1 into the silo 2 and from there are moved at the required rate by the conveyor 3. The conveyor with its load, passes through microwave heater 4.

After passage through the heater the bunches are delivered by the conveyor into stripper 5 where the fruits are separate from the stems of the bunches, the former being then passed by conveyor 6 to the digester for processing, while the stripped bunches are moved away on conveyor 8 for disposal, for instance by incineration.

The further processing of the fruits, which is not illustrated in the diagram, comprises pressing and optionally solvent treatment of the product of the digester which consists of the broken down pericarp of the fruits and the nuts. This is followed by mechanical separation of the pericarp from the nuts and cracking of the nuts for separation of the kernels from the shells (endocarp).

A main criterion for correction adjustment of the heating step is that cracking of the nuts and separation of the kernels and endocarp should proceed easily but that the kernels should not be overheated and discoloured. Other factors are that the fruits should separate readily from the stem of the bunches in the stripper and that the oil-splitting enzymes are inactivated.

Along with the benefit of improved yields of oil as a result of the avoidance of losses due to bruising of the fruits which is occasioned by the present method of handling and processing in large heavy loads in cages, and the use of steam for heating and sterilizing, the process of the invention confers many other advantages. A major advantage, for instance, is that regulation and control of the heating is simple and easy, and it may be adjusted according to the degree of ripeness of the fruits. Also, heating is even

throughout owing to the arrangement of the bunches on the conveyor and their continuous passage through the heater.

For start-up of the factory there is no need to leave a proportion of the previous day's fruit standing overnight, and start-up can be immediate and complete. The cost of maintenance of cages, bogies, capstan and sterilizers and the nuisance of oil and dirt on the factory floor is minimised.

#### WHAT WE CLAIM IS:—

1. A process for the extraction of oil from oil palm fruits which process comprises the step of subjecting the fruits to di-electric heating, in order to inactivate the oil-splitting enzymes present in the fruit.

2. A process as claimed in claim 1 wherein the di-electric heating is achieved by the passage of the fruits continuously through a microwave heater.

3. A process as claimed in claim 1 or claim 2 wherein the di-electric heating is produced by the action of an oscillating electro-magnetic field with a frequency of from  $1 \times 10^6$  to  $30 \times 10^6$  cycles per second.

4. A process as claimed in any one of the preceding claims wherein the di-electric heating is effected before removal of the fruits from the stems of the bunches.

5. A process as claimed in any one of the preceding claims wherein the fruits or bunches of fruits are passed on a mechanical conveyor through the microwave heater.

6. A process as claimed in any one of the preceding claims wherein oil is removed from the fruits after the di-electric heating step by means of mechanical devices such as a screw or a ram press, or a centrifuge.

7. A process as claimed in any one of the preceding claims wherein oil is removed from the fruits after the di-electric heating by extraction with one or more solvents, such as acetone.

8. A process as claimed in any one of the preceding claims substantially as hereinbefore described with reference to and as illustrated by the accompanying drawing.

9. Palm oil whenever extracted by a process as claimed in any one of the preceding claims.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

